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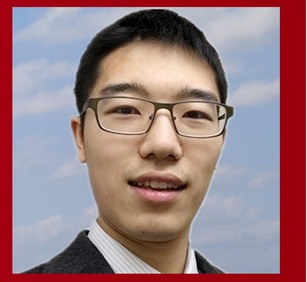

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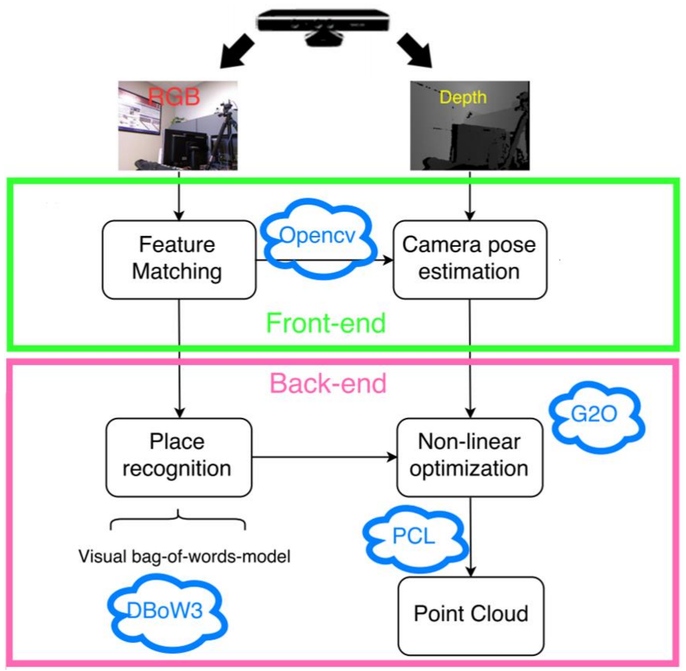
Real-time camera tracking and 3D scene reconstruction based on pose graph

Introduction

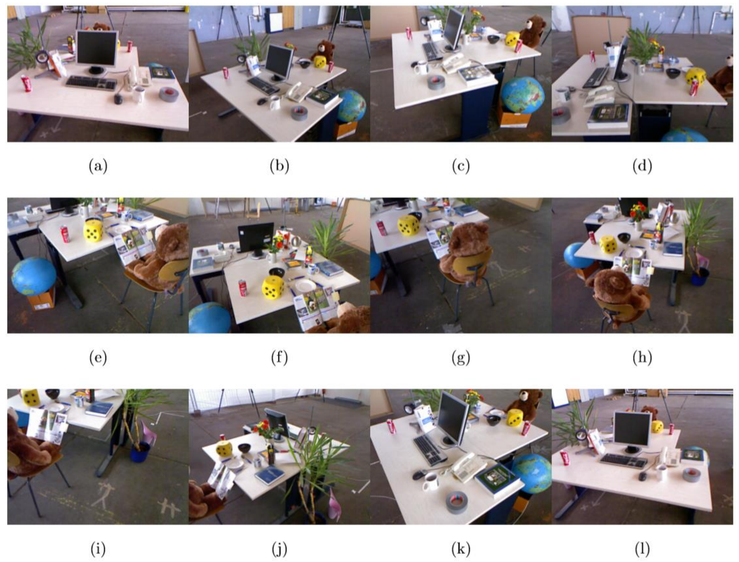
3D scene reconstruction is to recover the structure of scenes from a sequence of images. Many relevant applications in computer vision and robotics require the ability to quickly acquire 3D models of the environment and to estimate the camera pose with respect to this model. A real time 3D scene reconstruction system is used to solve the above problem. It can efficiently estimate the motion of the camera, align the current image to previously visited parts of the environment, and simultaneously create a 3D model.

Methodology



Input Data

The input data for our 3D reconstruction system is RGB-D video, which are acquired from a pre-calibrated RGB-D camera called kinect with known intrinsic parameters.



(a) (b) (c) (d)

(e) (f) (g) (h)

(i) (j) (k) (l)

Figure 1. Select RGB images in one RGB-D video

Camera Pose and 3D scene model

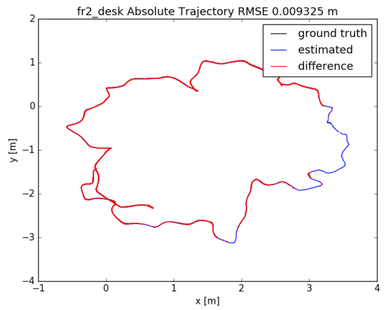


Figure 2. Camera pose and 3D model based on pose

Experimental Results

(a) fr1-xyz point cloud (b) fr1-floor point cloud (c) fr1-desk point cloud

(d) fr1-desk2 point cloud (e) fr1-room point cloud (f) fr2-xyz point cloud

(g) fr2-desk point cloud (h) fr3-office point cloud (i) fr3-nstr point cloud

Figure 3. 3D point-cloud on database

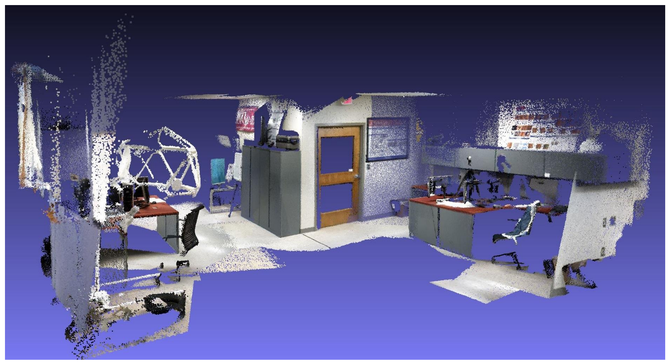


Figure 4. 3D point-cloud on real data

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